

CLAIMS

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1. A hydrogen purifying apparatus for oxidizing and removing carbon monoxide in a reformed gas containing carbon monoxide in addition to a main component of hydrogen gas, comprising a reaction segment having a catalyst layer for oxidizing carbon monoxide, a reformed gas supplying segment for supplying said reformed gas to said reaction segment via a reformed gas supply pathway, an oxidant gas supplying segment for supplying an oxidant gas on the path of said reformed gas supply pathway, means for cooling said catalyst layer at the upstream side, and means for heating said catalyst layer at the downstream side.

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2. The hydrogen purifying apparatus in accordance with claim 1, wherein said means for cooling said catalyst layer at the upstream side is a water-cooled apparatus and said means for heating said catalyst layer at the downstream side is a heater.

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3. The hydrogen purifying apparatus in accordance with claim 2, wherein said upstream side of said catalyst layer is formed by a different catalyst from that of said downstream side, and the catalyst constituting said downstream side exerts the activity at lower temperature than the catalyst constituting said upstream side.

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4. The hydrogen purifying apparatus in

accordance with claim 3, wherein said catalyst is supported by a metallic material.

5. The hydrogen purifying apparatus in accordance with claim 2, wherein said heating means utilizes reaction heat generated by reaction of carbon monoxide and hydrogen in said reformed gas with said oxidant gas.

6. The hydrogen purifying apparatus in accordance with claim 2, wherein a supplying amount of said oxidant gas is changed in correspondence with a temperature of said catalyst layer.

7. The hydrogen purifying apparatus in accordance with claim 2, wherein a flow pathway of said reformed gas is formed at a position close to or in close contact with said catalyst layer via a partition so as to heat said down stream side of said catalyst layer by a contact with said reformed gas before the passage through said cooling means.

8. The hydrogen purifying apparatus in accordance with claim 7, wherein said reformed gas passes through said catalyst layer in an opposing direction of stream to that before the same passes through said cooling means.

9. The hydrogen purifying apparatus in accordance with claim 7, wherein said reaction segment is

placed on the periphery of said flow pathway of said reformed gas before the passage through said catalyst layer.

10. The hydrogen purifying apparatus in accordance with claim 8, wherein said reaction segment is tube-shaped and said flow pathway of said reformed gas before the passage through said cooling means is formed around said reaction segment.

11. The hydrogen purifying apparatus in accordance with claim 10, wherein two or more reaction segments are connected in parallel.

12. The hydrogen purifying apparatus in accordance with claim 1, wherein a branched pathway is formed which bifurcates downstream from a connection between said reformed gas supply pathway and said oxidant gas supply pathway and is connected to said reaction segment at the middle point of said catalyst layer, said branched pathway acting as said means for cooling the upstream side of said catalyst layer or otherwise said means for heating the downstream side of said catalyst layer.

13. The hydrogen purifying apparatus in accordance with claim 12, further comprising means for changing the cross-sectional area of said reformed gas supply pathway and said branched pathway at their connection to said reaction segment in order to control an

amount of reformed gas to be supplied to said reaction segment from said reformed gas supply pathway and said branched pathway.

14. The hydrogen purifying apparatus in accordance with claim 13, wherein said reaction segment has at least a two-segmented catalyst layer and at least the uppermost catalyst layer has a part with no catalytic function or a part with low reactivity to CO.

15. The hydrogen purifying apparatus in accordance with claim 13, wherein said reaction segment has at least a two-segmented catalyst layer, and at least the uppermost catalyst layer is composed of a catalyst pellet and the lowermost catalyst layer has a shape of a honeycomb.

16. The hydrogen purifying apparatus in accordance with claim 13, wherein said reaction segment has at least a two-segmented honeycomb shaped catalyst layer, and the uppermost catalyst layer is larger than the lowermost side catalyst layer with respect to an open area at the honeycomb lattice.

17. The hydrogen purifying apparatus in accordance with claim 14, wherein the uppermost catalyst layer comprises a platinum group metal supported by the alumina group material and the lowermost catalyst layer comprises a platinum group metal supported by the zeolite group material.

18. The hydrogen purifying apparatus in accordance with claim 14, wherein said uppermost catalyst layer comprises a catalyst which was heated at a higher temperature than that of said lowermost catalyst layer.

19. The hydrogen purifying apparatus in accordance with claim 14, wherein said catalyst layer obtains a temperature measuring apparatus segment and means for controlling a supplying amount of said oxidant gas according to a temperature as measured.